



## SAN BERNARDINO MICROWAVE SOCIETY, Incorporated

FOUNDED IN 1955

A NON-PROFIT AMATEUR TECHNICAL ORGANIZATION DEDICATED  
TO THE ADVANCEMENT OF COMMUNICATIONS ABOVE 1000 MC.

### W6IFE Newsletter August 2012 Edition

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At the **August 2, 2012 SBMS meeting** will have a program by Chris, N9RIN.. The SBMS meets at the American Legion Hall 1024 Main Street (south of the 91 freeway) in Corona, CA at 1900 hours local time on the first Thursday of each month.

**Last meeting-** 19 people present. At the meeting last night, the **summer BBQ** was brought up. The time and place was worked out to be the following.

When: Aug. 4th, after the tune-up party (about 2 pm).

Where: Dennis Kidder (W6DQ) residence.

So start thinking about what you like to bring for the potluck. As we get closer to the BBQ day, we will start asking who is going to bring what.

It is just a little early to start that now but not too early to mark the day on your calendar.73, Chris n9rin  
Doug, K6JEY reported on the OVRO trip with a group of youth having the star party wind blown out but the Field Day effort by N7ND winning the day. Plans for the SBMS site at OVRO being a control room with pedestal were discussed. Chuck, WA6EXV will be turning a 10 ft parabolic dish into a cassagrain so many frequencies can be used. Others will be collecting the 1296 and 10 GHz gear to put behind the dish. Wayne, N6NB indicated the Heaps Peak 2.3 GHz beacon being off the air. Chuck, WA6EXV will be checking on its health in a couple of weeks. Dennis, W6DQ indicated there would be several SBMS members attending the Maker Fair at UC Irvine on 14 July  
Doug, K6JEY gave a good talk on Wattmeter Comparison Accuracies at 1296 MHz based upon Calorimetric Measurements. Doug pointed out that a 5% of full scale over frequency and power levels is +/-6 watts where as a 5% of reading is much better at +/- 0.5w. The Bird 43 meter had a 17 dB directivity to be considered when making measurements. Micro-match meters were the poorest of the meters measured. Struthers meters were OK in that they could be calibrated. Rohde and Schwartz were much better meters. The Bird 4410 has the best accuracy over power and frequency. The general conclusion was that if it worked at 432 MHz it was proably OK at 1296 MHz.

**We received the sad news that Paul Lieb, KH6HME passed away on 15 July at his mainland home. He was the Hawaii end of many contacts across the Pacific. He will be missed.**

**Scheduling:**

**August 4 Tune-Up Party Costa Mesa Fairview Park. BBQ at W6DQ 2 pm.**

**August 4-5 ARRL August UHF Contest**

**August 18-19 ARRL 10 GHz and Up contest part 1**

**August 16-19, 2012 The 15<sup>th</sup> International EME Conference in Cambridge, England.**

**September 8-10 ARRL September VHF QSO Party**

**September 15-16 ARRL 10 GHz and Up Contest part 2**

**October 18-21 Microwave Update 2012 in Santa Clara Biltmore Hotel**

**Wants and Gots for sale.**

**For Sale:** 30w 1296 MHz PA kit \$50 + \$5 for US shipping Chris Shoaff, N9RIN cshoaff@yahoo.com

**For Sale:** 10 GHz slotted waveguide antennas \$55 kit, \$80 assembled plus shipping Dan W6DFW [W6DFW@apex-scientific.com](mailto:W6DFW@apex-scientific.com)

**For Sale:** HP. 8441a preselector

HP. 3325b gen

HP. 3586c sel. level meter (vlf rec.)

HP. 436 435 power meters

Wiltron 2 ea. net. Analyzer. With one sensor

Efrmtam rubidium standard rack mount 10 5 1 .01 MHz.

10 GHz. horns

40 GHz. horn wr-28

Wiltron sweep gen. 6737b 2 to 20 GHz.

Marconi 2031 10 KHz. to 2.7 GHz. with all options

EPI 548a and 548B counters to 26 GHz.

Email or call 818 610 9932 with offers Larry. lnmbolster [lnmbolster@earthlink.net]

**Free-**I have a collection of the Qualcomm synthesizer boards etc. available for 10 GHz use, for free (pickup in Tucson -no shipping). Also FREE-- some 6 GHz Alcatel MDR6000 cell site pieces including power converters, OXCO's and linear amplifiers which will put out at least 1 watt in the ham band (no shipping either). This Class-A amps are broadband, and will need significant heat sinks. . Steve Bell Tucson 520 297 1282

**Wanted-** WR42 to SMA transition Chris. cshoaff@yahoo.com

**Wanted-**I guess my prospect in Alaska to buy a HP141T with tracking gen has evaporated. Repeated calls and e-mail were put-off even though the equipment was listed on a local swap list. So.....I can obtain the HP141T with IF and probably a lower freq RF deck from another source up here but he has no 8555's or tracking generators. I do not want to buy a complete 141T due size/weight shipping cost but if anyone has the 8555 or a lead to one, it would be appreciated. I need the SA for my new business fabricating kits on contract.

73, Ed - [KL7UW@acalaska.net](mailto:KL7UW@acalaska.net).

**For Sale-** 2 MACOM Gunnplexers, one Whitehouse transceiver, documentation \$40; 70 ft and various lengths of LDF4-50 ohm 1/2 inch heliax free Bill WA6QYR [bburns@mediacombb.net](mailto:bburns@mediacombb.net) 760-375-8566

**For Sale:** Here is a list of power meters available:

**Rohde and Schwarz NAP-** with 1100 watt head. Calibrated up to 1296MHZ with, new batteries, rubber cover, cord and manual in English or German. With spare NAP meter unit, no batteries. Deluxe unit with spares in calibration- \$1000 excellent condition.

**HP Power meter setup.** 1mw to 25watts, 1-18GHz. HP 8481B sensor and attenuator and 438 power meter. All functioning as it should. \$850. 438manual incl.

**Rohde and Schwarz NAUS.** Calibrated up to 1296MHZ-300w multi range power meter 30-1000mhz. Think of an HP432 with two meters and a high power sensor. \$200

**Heathkit IM 4190** three range 300 watt meter. Calibrated up to 1296MHz \$150

I have a very nice condition mixer for 47GHz. (33-50GHz) HP 11970Q. Round flange in nice shape. It is set for separate IF and LO inputs, but could be used with a Tek analyzer without the duplexer. Calibration data is on the back taken every 500MHz. \$300 plus shipping from Long Beach, CA 90806 Doug K6JEY

All prices are plus shipping from Long Beach Ca. 90806 Doug K6JEY drzarkof56@yahoo.com.

This year's **Microwave Update** conference will be in Santa Clara, CA (San Francisco Bay Area), October 18-21. Please consider writing one or more papers for the Proceedings and/or giving a talk at the conference. You will find suggested topics and detailed authors guidelines under the "Call for Papers" tab at [www.microwaveupdate.org](http://www.microwaveupdate.org). The deadline for paper submissions is August 18, which is in 6 weeks. Please let me know what topic(s) you have selected and then get back to writing up your latest microwave projects, ideas and experiences! Thanks and 73,  
Mike Lavelle, K6ML  
MUD 2012 Technical Program Chair  
Please reply to this address: [mud2012papers@gmail.com](mailto:mud2012papers@gmail.com)  
For more info on the conference, check out: [www.microwaveupdate.org](http://www.microwaveupdate.org)

**Activity reports** from 5 July SBMS meeting: Dick, WB6DNX is still rebuilding his 10 GHz rig; Chuck, WA6EXV is ready to install the 10 GHz beacon on Heaps Pk; Ed, W6OYJ is playing with his SDR dongle 60kHz to 1.2 GHz on eBay for \$20; Walt gave a talk at the Fullerton ARC; Dennis, W6DQ is building his 10 GHz HT and hopes to have a prototype at MUD; Courtney, N5BF is working on a 23 cm rig; Wayne, N6NB has 24 GHz stations built and has built another tower trailer for microwave; Mel, WA6JBD is putting together another radio link; Rein, W6SZ is building an SDR dongle for an IF pan adapter for an FT-817 radio; Jeff, KN6VR built a weak signal source for 1296 MHz; Pat, N6RMJ put a TV camera on his tower; Doug, K6JEY is half done on his 140 GHz radio, had 2 cw EME contacts in May, and has been asked to be a professor of Astronomy at University of Phoenix; Brian, AF6NA went to Hawaii and saw the KH6HME equipment and is building a new 10 GHz rig; Chris, N9RIN is starting over on a 24 GHz rig; ATV had one check in KE6BXT.

**60 degrees North Electronics Company.** I am starting up a kit making service for assembling certain kits made by Down east Microwave. For those that do not want to make their own kits or maybe it's gotten too difficult, or just don't have the time or want assembled kit faster than DEMI can supply it. This one-man business so I will only be able to build a limited number per month. My price is the same as offered by DEMI assembled, plus shipping which should be medium-size flat-rate priority mail in the US. I am expecting to be able to deliver within 30 days of receipt of paid order. I am not carrying any inventory so this allows shipping time to obtain kits and any other materials, and time to test the finished product plus ship to the customer. At this time I am limiting this to the VHF/UHF 25w Transceiver kits. In a couple months I hope to add three amplifier kits from Communications Concepts, Inc. If there is a something special you want assembled contact me. My professional credentials are at: <http://www.k17uw.com/60NE.htm> Ed Cole

## Threads

You guys are complaining about lack of traffic. I'll give you some traffic. What about this question... What ever happened to interest in Gunnplexers? You never hear about them anymore. In fact the level of discussion on this eclectic's mailing list is almost at the level of IEEE. I realize that there's no plug and play ham gear hence the most sophisticated hams end up UHF and above, but let's not forget that there is such a thing as microwave crystal sets. How about somebody sharing some joy playing with beginner stuff? Walt

Hi Walt,

In the good old days, when most 10 GHz rigs [solid state] were Gunnplexers, I roved and manned the mountaintops during the 10 GHz contests, even getting top score for O-land one year and earning VUCC, and making a 260 km Q using just my 10 mW Gunn rig and a 19" dish with a penny feed.

Since that time, however, most of the uWave guys around here have invested in SSB and higher-power rigs to work the "tough paths", like rain scatter and even some EME. I've just never been able to justify the one grand expenditure to join 'em (nor the cost of gas to go roving anymore!).

Further, Gunnplexer technology has pretty much matured. I mean, after you've got an 8V bias source, a WBFM 30 MHz IF and waveguide antenna, there's really not much more advancement opportunity in that art, and most of its already documented in the user manuals for the MaComm rigs.

Given that, I don't expect that this thread will incite a monstrous string of traffic.

73 de Mike W5VSI

Thanks for the note on your experience with Gunnplexers. It sounds like fun and very affordable. There seems to indeed be a progression in the state of the art of hobbies doesn't there. And communications streams like this one run by Tom Williams is really for those who push the technology. I'll keep watching for stuff I understand as it goes by. Perhaps my contributions would be more appreciated in less sophisticated venues like the young people who go to "Maker Fairs" and the young people who occupy hacker spaces.  
Walt

Walt,

I have two 10mw Gunnplexers that I bought thru the SBMS in 1979 before moving to Alaska. That was 32-years ago. Technology has progressed from WBFM to CW/SSB and now to innovative narrowband digital modes like JT65. The "drifty" super voltage-sensitive Gunn's just are not up to doing these modes. 100-KHz wide FM is limited in sensitivity so is limited in range. JT65 with its effective BW of 4.7 Hz increases sensitivity by  $10\log(100,000/4.7) = 43$  dB. But Gunn's cannot be stabilized enough to run that narrow and probably have high phase noise as well.

They are possibly useful for dedicated control links or wide-band digital but there is off-shelf equipment for WIFI so why bother.

I upgraded to an xtal controlled transverters in 1999, and today we can run them from phase-locked synthesizer boards to achieve under 10-Hz accuracy.

Gunn's were fun in their time - but their time is past.

73, Ed - KL7UW

They still may find use as signal sources or testing.

Hi Walter and it's easier today to get on.

Most old Police Radar Detectors can be tuned to 10.250 GHz, and many of the talkies today can be used as the 30 MHz IF. Heck, I once used my Icom 706 Mark II as a Gunnplexer/Escort IF.

Good Newbie projects. Kent WA5VJB

At the risk of sounding like I'm bragging, which I am not.....

Let me just point out that the very first 47GHz VUCC and a former World DX record for the 47GHz band was done by yours truly and was completed with a Gunnplexer System with WB FM!

I added an audio oscillator to the mike input to help copy MCW when the dew point was high and WB FM voice was hard to copy. But that very same system then was used to earn VUCC #2 by working 7 grids in New England during an ARRL contest. While most have moved on to CW & SBB for very valid reasons, don't forget that you too might make a DX record or VUCC with a simple set of Gunn sources and mixers. And the 47GHz Gunn's were found at Dayton too! :- )

-Brian, WA1ZMS/4

Despite their being a "sunset" technology in the ham world, Gunnplexers can still provide nice low-cost wideband comm. links, and they're a great low-cost entry point for newbie's who can't link up with a better-equipped Elmer. I'd dare to bet that many on this reflector started out with multiplexed WBFM rigs, either using Gunn oscillators or klystrons before moving onward into more sophisticated technology. Heck, I'll admit that a buddy of mine and I converted an old surplus "tail end Charlie" X-Band radar for use as a speed radar back in the early 60's, using a beer can polaplexer.

My 30 MHz IF was a converted Pioneer manually-tuned car radio. Try to find one of those today!

73 de Mike W5VSI

Gunn's were fun in their time - but their time is past.

Hmmm. Isn't there still a lot of AM activity on HF with "boat anchors," to say nothing of CW (!)? Why do people on HF use CW when the digital modes with their narrower bandwidths offer much better detection capabilities?

Gunnplexer technology has pretty much matured. I mean, after you've got an 8V bias source, a WBFM 30 MHz IF and waveguide antenna, there's really not much more advancement opportunity in that art, and most of its already documented in the user manuals for the MaComm rigs.

Given that, I don't expect that this thread will incite a monstrous string of traffic.

Most of the technology re: HF was known by the mid-'30s, so why are most hams HF'ers? Why aren't they UHFer's and Microwavers where there's still "stuff" to discover?

How about somebody sharing some joy playing with beginner stuff? Good idea. There are STILL people building and using crystal sets. They're easy to build and understand, and above all, CHEAP. Get young (and not-so Young) people involved in CHEAP projects to get 'em to take the hook. Have you looked at the minimum cost to get into the hobby recently? \$1000 will get you An HF+6m+2m all mode. As was pointed out, it can be ~\$1k to get going on 10GHz narrowband. A Gunnplexer system could be ~\$100. Hmmm... One-tenth the cost... hmmm.

The only problem I see at the moment is that Gunnplexers have become hard to find. (I'm not talking about the ARR "true" Gunnplexers," just the run of the mill Gunn oscillators used for detection, motion, etc. Even Radar detectors are hard to find these days.)

73 Donn WA2VOL/0

Microwavers--I have a pair of higher power Microwave Associates 200 mW Gunnplexers that I got about 20 years ago. I also have a pair of 30 mW Gunnplexers. I used the high-power units for a wide band video link and was able to send and receive signal quality video from a Tektronix 147 NTSC Test Signal Generator that met broadcast studio standards on the receiving end. Never mind that the signal was about 10 megahertz wide....

It seems to be "common knowledge" that Gunnplexers are all temperature and voltage sensitive to the N'th degree and drift around by hundreds of KHz just by staring at them too hard.

In most cases, maybe so, but I had a friend who had a pair of 100 mW Gunnplexers that he had worked out some sort of phase-locked arrangement by injecting a harmonic of an external crystal reference.

I believe they stayed almost as close on frequency as any recent vintage PLL brick oscillator. I have also seen Gunnplexer pairs where one of them had an AFC that could start from dead-cold scratch and search up and down until it found the way-off-frequency signal of its mate and lock onto it.

Hmmmmmm.... if I were not so committed to refining my NOAA polar orbit HRPT downlink I would fire up my pair of Gunnplexers and see if they still work.... I wish I had the circuit for that AFC search-and-lock that I saw working so well on them.

Here is a DropBox link to a (low-res screen capture) of an image I downlinked a few days ago from NOAA-18:  
< <http://dl.dropbox.com/u/60102282/Web%20HRPT%201530%2026%20APR.jpg> >

Mike Baker WA4HFR

Hey, I built AFC and a sweeper into my "contest grade" Gunn rig, and I think a pal of mine, Dave KB0LP, presented my paper on it at one of the uWave conferences in the '90's. The sweep width was variable and ran a triangular 10 Hz signal to the varactor. When I was sweeping the horizon for a signal, I'd hear a 10 Hz buzz (so would he!) that varied in amplitude with the received signal strength. I'd aim the dish for max buzz, and then tweak the tuning to audibly center the sweep on his sig, gradually dropping the sweep width, as I went; a centered sweep took on a unique "galloping" sound. Once I knew I was close, I'd take note of the DC tuning voltage to determine if I was 30 MHz high or low, and then switch from sweep to the appropriate AFC polarity. Worked like gangbusters. I think there was a schematic in the paper, and I might even have a copy of it somewhere that I could send to anyone interested, off this reflector, of course.

Still have that rig, but no one to talk to with it :-(. And the lead acid gel battery has long since gone south.

73 de Mike W5VSI

Here is an article showing an example of how you can phase-lock a Gunnplexer using technology available in the late 80's:  
<http://www.sonic.net/~n6gn/hr88/articles.html>

I actually built this system and still have a few of the pieces of it around. If I were going to do something similar, I would update some of the circuits using more modern parts and technology. I wondered about the phase noise of the Gunn source but it seemed good enough back then. The diode used in the 10 GHz mixer is extremely difficult if not impossible to get these days. There are better mixer circuits around now.

73, Zack W9SZ

Got Gunnplexer?

See: [http://72.52.208.92/~gbpprorg/mil/radar/The\\_Gunnplexer\\_Cookbook.pdf](http://72.52.208.92/~gbpprorg/mil/radar/The_Gunnplexer_Cookbook.pdf)

What's old is new again...Steve

## More thread

74GHz is being used for proximity, mostly back up warning, radars. We lost some ham band too it. I suspect the hardware is highly integrated and in a tiny package with little frequency flexibility. 73, Jerry, K0CQ

On 6/5/2012 11:44 AM, Richard Gill wrote:

- > Yes the Gunn oscillator has evolved. Even the cost on these has risen,
- > sometimes to hundreds of dollars when you can find them. A good source
- > is the older police radar units that are being replaced by Laser
- > Units. I have a few Ka band units
- > (34 GHz) units lying around. I wonder if they could be coaxed up to the 47 GHz.
- > Look what it costs to get to get on 47 GHz these days. Even if you
- > have the if rig, only one source that I know of.
- > Check out this article about using 10 and 24 GHz Gunn transceiver system:
- > [http://www.ka7oei.com/10gig\\_wfm\\_tempctl.html](http://www.ka7oei.com/10gig_wfm_tempctl.html)
- > Some time back there was some chatter about 74 GHz being used in the
- > Auto industry. Which might lead to some surplus equipment becoming available>.
- > Anybody seen anything on this? Rich KQ6EF

One vendor I know for sure used a UMS 38GHz die and a matching harmonic mixer to get on 76GHz.

As hams, we "lost" the lower portion of the band to Car RADAR. But we're still OK here in the US on 78.192GHz. That's the general frequency to use these days.

If you look at some of the loss charts I did for the WA1MBA web page, I

\*think\* one of them shows that for VERY long haul paths (i.e.: 200km+) the losses at the very top end of the band will result in just a dB or two more signal than at the lower end.

Another interesting thing you will see in the charts (which are based on the Liebe Model) show that at VERY low dew points, the loss starts to crawl back up! I did not expect to see that.

But with a little meteorology investigation it's true. As the water vapor level drops, it becomes displaced with slightly more oxygen. Thus, the loss chart starts to inflect and the path loss from the atmosphere goes back up. Just a TINY bit. But enough to see that if you were on Pike's Peak here in the US trying for record DX, you'd have to pick your weather just right to get every bit of signal you can on a LONG path.

Just my 2 cents...73, -Brian, WA1ZMS/4

76 to 77 GHz is used for smart cruise control on Jaguars and Range Rovers?

The radars, along with a microprocessor, track targets in front of you and in adjacent lanes in front of you and use that data to slow down or speed up slightly when you're in cruise control. (for the people who drive with really lazy feet)

My 2010 Ford Fusion has it (76 GHz radar) for blind spot radar as well as backing up...side looking radar...this is starting to be a much more common Safety feature in new cars...works great and I highly recommend it!  
Barry VE4MA

I was told by someone (possibly NE8I) that he was using 78336. That's a harmonic of 1152 MHz, which puts it in line with all the other microwave frequencies except 47088.

I suppose it doesn't matter much as long as you know what frequency the person you're trying to work is using. There aren't that many people on that band. I don't expect any pileups.

:~) 73, Zack W9SZ

Hi Ed:

Some years ago I build up a 300 milliwatt Gunn, 18" dish, and a GaAs FET IF amp. We were able to do tropo scatter with that one.

Zack Lau has taken a Gunnplexer farther than anyone else I know.

.3 Watts was right at the limit of having the mixer diode and the transmitter in the same bit of waveguide. If I had ever pointed the dish at a metal object up close, the reflected power would have taken out the mixer diode.

Zack split the TX and Rec using two large horns. Now the TX could go through an amp of the desired size, and a GaAs FET preamp could go on the Rec. With a separate line some of the TX was feed back into mixer diode so the transmitter could also be the receiver Local Oscillator. With this configuration the 1 watt, 1 dB NF Gunnplexer is practical.

It is also possible to put a 2nd circulator on the output of the Gunn module. This will split the TX and Rec paths. Again a power amp on the TX path, a preamp on the rec path, going to two antennas. You are really forced into using two antennas.

Any SWR/Return Loss in the antenna goes right back into the rec. At 10 milliwatts this is how the Gunnplexer controls the receiver LO. At several watts any reflected power will take out the preamp or mixer. It is nice to have full duplex QSO's. WA5VJB

The new products page (155) of the latest (May, 2012) MW&RF

([www.mwrf.com](http://www.mwrf.com)) magazine mentions the Hittite HMC6000 transmitter and

HMC6001 receiver MMICs. The transmitter is referenced to an external crystal reference and steps from 57 to 64 GHz in 500 or 540 MHz steps depending on the reference frequency. It takes I and Q modulation inputs with gain to 38 dB (17 dB gain control range), to give +12 dBm linear and +17 dBm saturated output. The receiver puts out I and Q with a baseband up to 1.8 GHz and contains programmable baseband filters to removed residual DC offset and local oscillator feed through signals and to set the low pass filter for baseband signals. NF is 6 dB at maximum gain with a 65 dB gain control range (1 dB steps). Phase noise is typically -86 dBc/Hz at 1 MHz offset. I wonder what extremes it might work in frequency if one didn't care about step size and picked the reference to get in 47 or 78 GHz ham bands.

On the same page it mentions a "low frequency" Analog Devices ADL5324 MMIC that puts out +29.1 dBm P1 at 2.14 GHz, with 14.8 dB gain and a NF of 3.8 dB. It's useful from .4 to 4 GHz, runs on 3.3 or 5 volts at 62 to

133 ma, and 3rd order intercept is +43.1 dBm at 2.14 GHz. It's in a

SOT-89 package and costs \$3.35 in thousand lots.

73, Jerry, K0CQ

I can't speak to how a specific unit works that I haven't seen, but I'd expect:

FMCW radar with a swept frequency. The beat note received with the transmitter as LO would be proportional to distance to the target offset by any Doppler as a result of relative motion. I/Q outputs can help separate motion from distance with a little mathematics.

A molded metalized plastic antenna with progressively longer paths will deliver a 1D scan, similar to squint on a waveguide slot antenna run off its center frequency.



Doug, K6JEY (right) talks with Wayne, N6NB during the 5 July SBMS meeting.





**Chris, N9RIN (left) and Courtney, N5BF look over the free-bee items at the 5 July SBMS meeting**



**Chuck, WA6EXV looks on as Ed, W6OYJ shows off his SDR dongle software at the July SBMS meeting.** The San Bernardino Microwave Society is a technical amateur radio club affiliated with the ARRL having a membership of over 90 amateurs from Hawaii and Alaska to the east coast and beyond. Dues are \$15 per year, which includes a badge and monthly newsletter. Your mail label indicates your call followed by when your dues are due. Dues can be sent to the treasurer as listed in the banner on the front page. If you have material you would like in the

newsletter, please send it to Bill, WA6QYR at 247 Rebel Road Ridgecrest, CA 93555 **or**, **bburns@mediacombb.net**, **or** phone 760-375-8566. The newsletter is generated about the 15<sup>th</sup> of the month and put into the mail at least the week prior to the meeting. This is your newsletter. SBMS Newsletter material can be copied as long as SBMS is identified as source.

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